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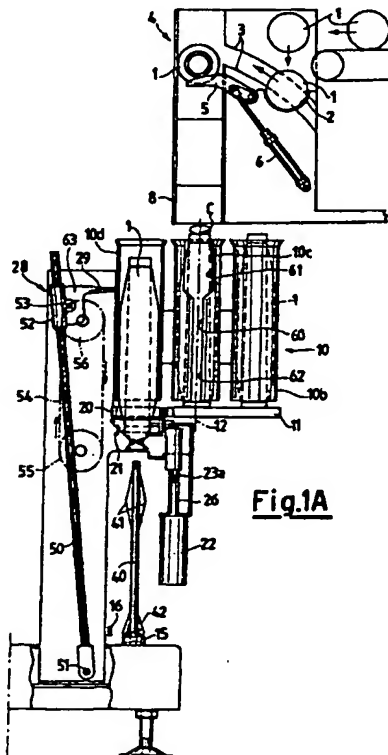
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(54) Device for loading spools onto a plate support, for transport and positioning of the spools in textile machines

(57) Device for loading spools onto support plates, which are provided with a rod and centring and restraining springs, in order to send the said spools for winding, comprising a device for presentation and centring of the spool on the support, in order to fit the tube of the spool onto the top of the rod, and a spool-fitting device, which can travel a path which corresponds to fitting of the spool, as far as its base stop on the support plate.



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Description

[0001] The present invention relates to the movement of spools in textile machines for preparation of yarns, and in particular to a device and a method for loading the said spools onto an individual, mobile support, for transport and positioning of the spools during processing.

[0002] In the known art, substantial preference has been given to moving the spools and tubes in the operations of production, control and packaging of the yarn, starting from textile fibre roving, using plate supports, to be placed on conveyor belts or similar movement units used by the machine, in order to convey the said spools and tubes individually to and from the work stations, at which spinning and spooling in particular are carried out.

[0003] In general, the said plates are provided with a vertical central pin, which makes it possible to keep the spools in an erect position, not only during transport, but also during the steps of preparation and winding, virtually without touching the spools, and with handling only of the plates, without the latter needing to touch, and slide in contact with, the machine, and therefore become dirty or damaged.

[0004] A problem which is associated with the use of plate supports according to the known art arises during the step of winding the spools in the spooler. In fact, account must be taken of the fact that in spoolers of the most recent design, the winding speeds are very high. This therefore generates stresses, which tend to displace the spool, or even pull it off the pin of the plate, on which it is simply supported as it is wound.

[0005] In order to eliminate these disadvantages, more elaborate plate structures have been proposed, in which the plate is provided with resilient means for retention of the spool, as well as with conical raiser fins for centring of the latter, for example in patents DE-A-4,236,038, and USA 5,297,761 in the name of Schlafhorst, and in the Italian patent application MI96A125 and European patent application EP-A-844,206, in the name of the same applicant.

[0006] These technical solutions consist of fitting the tube of the spool on the plate, centring it, and overcoming specific resistance by the resilient retention means. This problem is significant, particularly if account is taken of the fact that the rate of supply of the spools to the spooler is very fast, particularly during the steps of starting up, or a change of processing. The time allowed for loading a spool onto its plate, and for starting the processing, is approximately one second or slightly more.

[0007] In order to make more apparent both the technical problems posed and solved by means of the present invention, and its characteristics and advantages relative to the known art, the present invention is described here, purely by way of non-limiting example, with reference to its application for loading spools in a

spooler, using a plate support, as described in the aforementioned European patent application EP-A-844,206, in the name of the same applicant.

[0008] The present invention thus relates to a device and a method for loading a spool onto the individual plate support, which are defined in their most general sense, in the first claim in the case of the device, and in the eighth claim in the case of the method.

[0009] The characteristics and advantages of the device and the method according to the present invention are made more apparent by the description of a typical embodiment, provided by way of non-limiting example, which is illustrated in figures 1 to 10.

[0010] Figures 1A,B,C, illustrate respectively the device as a whole seen in lateral, plan and front view, relative to supply of a new spool. Figure 1A relates to the step of arrival in the device of the spool to be loaded on its transport plate.

[0011] The spool 1 is conveyed to the device by known means, for example by a conveyor belt, and is deposited flatwise in a waiting tray 2, in a position which is random as far as orientation of the spool is concerned. The spool is then transferred along the guides 3, by means of a thrust unit which is not shown in the figure, to the loading station 4. In this loading station, the spool 1 is supported on two retractable and extendable levers 5_d and 5_s, each of which is actuated by its own double effect piston 6. The ends of the conical tube of the spool 1 are supported on the said levers, as shown in the detail in figure 1C.

[0012] The tube is probed by a sensor 7_s, in order to determine on which side there is disposed the base with the larger diameter, which corresponds to the foot of the spool, and, on the other hand, to determine on which side there is disposed the top of the spool, i.e. the end with the smaller diameter. The sensing system is of a known type, as described for example in Italian patent 1,237,924 in the name of the same applicant.

[0013] If, for example, the sensor 7_s detects that the foot of the spool, in the detail shown from the front in figure 1C, is disposed on the right-hand side, the lever 5_s is retracted, and the spool 1 is allowed to drop with its base facing downwards, according to the arrow A, which is shown as a solid line. In the opposite case the lever 5_d is retracted, and the spool 1 drops according to the arrow B, which is shown as a broken line. After the spool 1 has been released, the lever 5_s or 5_d which has been actuated is re-armed, in order to receive a new spool.

[0014] The spool is guided as it drops by a duct 8, which is in the shape of a funnel, and ends just above one of the cylindrical containers of the rotary device 10, which makes the spools it contains rotate on a fixed platform 11, in order to make the spool drop in an erect posture into the position 10a. This device is provided with drive means, which are not shown in the figure for the sake of simplicity, which make it rotate clockwise in steps around its own axis 12, according to the arrow C.

[0015] In this rotation in steps, the device 10 takes its spool-holder apertures 10a-d into a plurality of positions, of waiting or work. In the embodiment which is shown in the figures, by way of example there are four of these positions, from 10a to 10d. There can be a different number of positions, depending on the positions of work and waiting, to be allocated to the device 10. Again by way of example, the position 10a is the one in which the spool to be fitted onto its plate is received; the position 10b is the one in which the spool is removed from the so-called "secondary winder", in which the residual winding of coils of yarn around the base of the tube is removed, in order to be grasped and cut by known means; position 10c is one of transit, without specific functions; and position 10d is the one which is dedicated to centring, release and raising of the spool onto its plate support 15.

[0016] For each plate 15 which is presented beneath the cylindrical aperture in position 10d, the device 10 rotates by one step, and takes a new spool into the said position 10d. The arrival of the plate support 15 is detected by means of a sensor 16, for example a photo-cell, which supplies a signal to the control unit of the machine, which in turn issues the command for corresponding actuation of the device 10, and for the loading operations. For the operations of loading the spool, the plate 15 is locked in position, for example by means of a pneumatic piston, which is not shown in the figure.

[0017] In the platform 11, at the position 10d, there is provided a circular aperture 20, which makes the spool drop into a device beneath, which is in the form of a funnel 21, in the shape of a cone, which can be opened. This funnel device 21 can be moved vertically, between a highest position which is shown in figure 1A, and a lowered position, and it can be opened and closed, as illustrated in the following figures.

[0018] Figure 2 shows the spool 1 contained in its cylinder 10d, ready for the operation of centring and fitting on its transport plate 15, which is disposed beneath the funnel 21. The said funnel is moved by the double-effect pneumatic cylinder 22 along the vertical guides 23, between two end-of-travel stops 24 and 25, by means of a slider 26. With the action of the centring funnel 21, there is associated the action of a fitting device 28, which thrusts the spool onto the plate 15, by means of a circular end element 29, to be supported on the top of the spool 1.

[0019] Figures 3, 4, 5 and 6 illustrate the structure and the functioning of the funnel device 21. In figure 3, the funnel device 21 is shown in its closed configuration, in the highest position. The funnel is subdivided into two conical parts 31a and 31b, which have two opposite levers 32a,b, and are pivoted by means of the pins 33a,b onto a moving element 34, which is provided with hollow guides 35, with a shape and transverse dimension which is compatible with that of the guides 23a,b, and is slid on the latter with vertical reciprocal motion, owing to the effect of the travel of the slider 26, which is

actuated by the cylinder 22. In figure 3, the levers 32a,b, are supported respectively against their upper end-of-travel stops 24a,b. The configuration in figure 3 corresponds to the state in figure 2, of the operation of loading the spool.

[0020] In the configuration in figure 4, the moving element 34 is lowered to an intermediate level, again with the funnel 21 closed, until the levers 32a,b are supported on their lower end-of-travel stops 25a,b. The configuration in figure 4 corresponds to the step in figure 7, of the operation of loading the spool 1. The spool 1 has been lowered until it is centred, and the base of its tube is fitted onto the top of the plate support 15. According to a preferred embodiment of the invention, this operation is assisted by the end part of the funnel 21, which is in the shape of a funnel with conicity contrary to that of the upper part of the funnel itself. In other words, the end part of the funnel 21 has conicity with the vertex facing upwards, whereas the body of the funnel 21 has conicity with the vertex facing downwards. In fact, this shape of the end part makes it possible to return to the correct position the top of the rod of the plate, if the latter is imperfectly positioned before being engaged with the spool.

[0021] In this position, the spool cannot fail to pass its tube through the cavity, onto the rod 40 of the plate 15 beneath.

[0022] In the configuration in figure 5, the moving element 34 is lowered to its lowest level, owing to the effect of further lowering of the slider 26. The levers 23a,b, which are supported on their end of travel stop 25a,b, rotate their semi-conical parts 31a,b around the corresponding pins 33a,b, in order to open the funnel 21 completely. The configuration in figure 5 corresponds to the step in figure 8, of the operation of loading the spool 1. The spool drops inside the two open parts 31a,b of the funnel, and its tube is inserted on the rod 40, until it is supported on the leaf springs 41, which project from the rod, and prevent the tube from descending further downwards.

[0023] In figure 6, an improved embodiment of the device according to the invention is illustrated. The two positions of opening and closure of the funnel 21 are kept fixed during the descending and rising travel of the moving element 34, by means of two spring blocks 45a,b, which are positioned such as to secure the two half-cones 31a,b of the funnel 21 in the position of opening and closure, during the rising and descending travel. Of the two blocks 45, in figure 6 there is shown only the block indicated as 'b', since the right-hand block, which is indicated as 'a', is specularly symmetrical relative to the former, and is the same as it. The block 45 consists of a ball 46, which is thrust towards the exterior by a spring 47, both of which are accommodated in a cavity 48. In the body of the moving element 34, there are provided two pairs of cavities 49a,b and 50a,b, which have dimensions compatible with that of the balls 46a,b, and which correspond to the open and closed positions of

the funnel 21. When the funnel 21 is closed, as shown in figures 3 and 4, the balls 46a,b of the blocks 45a,b are at the cavities 49a,b. The springs 47a,b thrust the respective balls 46a,b towards the exterior, such that they engage with the cavities, and keep the funnel in the closed position. During the descending movement of the moving element 34, as far as the configuration in figure 4, the funnel is kept closed. When the moving element 34 continues to descend as far as the configuration in figure 5, it forces the balls 46a,b to return, thus compressing the springs 47a,b, and to move towards the exterior until they reach the cavities 50a,b, in which the springs 47a,b once again thrust the respective balls 46a,b towards the exterior, until they engage with the said cavities, and keep the funnel 21 in the opening position, until the rising path of the moving element 34 is completed, and until the configuration in figure 3 is obtained. On completion of the return path, the levers 32a,b are once again supported against their upper end-of-travel stops 24a,b, and rotate in closure the two half-cones 31a,b, in order to close the funnel 21. The spring blocks 45a,b return to the cavities 49a,b.

[0024] The operations of loading and fitting the spool take place according to the steps shown in figures 2, 7, 8 and 9, by means of co-operation between the mobile funnel 21, and the fitting device 28, which thrusts the spool 1 onto the plate 15.

[0025] The fitting device 28 can press with its end element 29 on the upper end of the spool, in order to overcome the resistance of the centring springs 41, which are disposed on the rod 40 of the plate, and to make them return into their seat, such as to allow the tube of the spool to slide downwards, until it is supported against the conical stop 42 at the base of the plate 15, and is centred and locked.

[0026] This fitting device 28 comprises a straight guide 50, which is pivoted at a pin 51, and oscillates around the latter. On the said guide, there slides a slider 52, which supports the said thruster or fitting end element 29. The motion of oscillation of the guide 50, and of reciprocal travel of the slider 52, is determined by a pivoting restraining device 53 of the slider 52, which for example consists of a pin which is secured to a link of a chain 54, which circulates around two toothed wheels 55 and 56, one of which is provided with rotational drive by a motor 59. As illustrated in the configurations in figures 2 and 7, the chain circulates in a clockwise direction, and takes the slider into the position of maximum raising of the thruster 29, by means of the guide rod 50, which is still displaced relative to the spool. Whereas the pivoted restraining device 53 travels around the toothed upper wheel 56, the plate thruster 29 is moved above the end of the spool, as indicated in figure 8.

[0027] In order to permit passage of the said thruster, the cylindrical elements 10a-d of the loading device 10 are provided with an aperture 60, at their tangency with the circumference of the lower platform 11, with a wider aperture 61 in the upper part, in order to allow the plate

of the thruster 29 to penetrate inside the cylindrical container 10a-d, and a narrower aperture 62, in order to permit passage of its rod 63. The aperture 62 is also provided in the fixed platform 11, in order to allow the element 63 to pass through.

[0028] The guide rod 50 is now in a vertical position; the slider 52 begins its descent, the thruster 29 comes into contact with the top of the tube of the spool 1, and starts to press it downwards, when the two half-cones of the funnel 21 have opened, and the tube of the spool 1 has been fitted onto the rod 40 of the plate 15, and has dropped until it is supported on its springs 41.

[0029] After or during the descent of the thruster 29, the two half-cones 31a,b of the funnel 21, in the configuration in which it is still open, are free to rise, and to close when they have finished rising, as already previously described, provided that the spool 1 has already been thrust downwards onto the plate 15, and is not blocking the trajectory of closure of the half-cones 31a,b.

[0030] In the configuration in figure 9, the pivot 53 of the slider 52 has reached a position in which it travels around the lower, toothed return wheel 55. The guide rod 50 begins to retract, and oscillates around the pin 51, the thruster 29 moves rearwards, thus allowing the spool 1 to travel the last fitting section, and then moves away from the spool. The plate 15 with the spool 1 loaded can be moved away, and replaced by a new plate, for loading of a new spool. The useful path of the thruster element 29 corresponds to the length of travel required for the action of fitting the tube of the spool, whilst overcoming the opposition of the springs 41; this path depends both on the geometry of the tube of the spool, and on the shape of the rod of the plate, with its springs. The path of the thruster 29 can easily be regulated by adjusting the distance between the toothed wheels 55 and 56, as well as the length of the chain 54.

[0031] In the configuration in figure 10, the pivot 53 of the slider 52 has travelled around the lower, toothed return wheel 55, and has taken the rod 50 into the position in which it is furthest away. As the slider 52 rises to the position in figure 2, a new plate arrives. As a result of the arrival of the latter, a step by the loader 10 takes a new spool into position 10d, in which the funnel 21 is already in the raised position, and is closed in order to receive the spool. The loading cycle can then be repeated for the said new spool.

[0032] The operations described, which are carried out by the movement actuators of the funnels 21, the initial presenters, the rotary distributor 10 and the fitting device 28, are controlled and co-ordinated by the control unit of the machine, in order to guarantee the necessary synchronism between the various component devices, and in order to prevent interference and collision between the parts, or any damage to the yarn of the spools. The start and end of each step of the method for loading the spool is controlled, in order to give the go-ahead for implementation of the successive

step, and to verify the duration of the latter.

[0033] The device and the method for loading the spools onto their spring plates makes it possible to carry out supply to a spooler in short periods of time, whilst securing the spools firmly and efficiently to their support plate, without involving any constraints in the speeds of winding, or in the accessory preparation operations.

[0034] The device can also easily be adapted to spools and tubes of the entire range of tubes which are used in the operations of preparation and finishing of the yarn. Differences of shape of the spool support plate can also easily be overcome, by means of the same regulations and adjustments.

Claims

1. Device for loading and centring of spools (1) on support plates (15), which are provided with a rod (40) and centring and restraining springs (41), to be sent for winding in an automatic spooler, characterised in that it comprises a device (21) for presentation and centring of the spool (1) on the support (15), in order to fit the tube of the spool (1) on the top of the rod (40) of the support (15), and a device (28) for fitting the spool, consisting of a slider element (52), which is provided with means for actuation of vertical travel with reciprocal motion, and is provided with an end thrust element (29), which can follow a useful path which corresponds to fitting of the tube of the spool, until it is supported against the conical base stop (42) of the support plate (15).
2. Device for loading and centring of spools (1) on support plates, according to claim 1, characterised in that the device for presentation and centring of the spool (1) on the support (15) consists of a funnel (21), which can be opened into semi-conical elements (31a,b), and is mobile with vertical travel.
3. Device for loading and centring of spools (1) on support plates, according to claim 2, characterised in that the device for presentation and centring of the spool (1) on the support (15), which consists of a funnel (21), is shaped in its end part in the form of a funnel with conicity which is contrary to that of the upper part of the funnel (21).
4. Device for loading and centring of spools (1) on support plates, according to claim 2, characterised in that the funnel device (21) for presentation and centring comprises locking units (45a,b), which are designed to secure the half-cones (31a,b) in the position of opening and closure, during the rising and descending travel of the device itself.
5. Device for loading and centring of spools (1) on support plates, according to claim 2, characterised in that the funnel device (21) for presentation and centring comprises levers (32a,b), which are pivoted on a moving element (34) which can perform vertical reciprocal motion, and open and close the half-cones (31a,b), when they meet respectively the lower (25a,b) and upper (24a,b) end-of-travel stops.
6. Device for loading and centring of spools (1) on support plates, according to claim 1, characterised in that the device (28) for fitting the spool comprises a straight guide (50), which is pivoted and oscillating, on which there slides a slider (52) which supports the end thrust element (29), the motion of oscillation of the guide (50) and of reciprocal travel of the slider (52) being determined by a pivoting restraining device (53) of the slider (52), which is secured to a chain (54), which circulates around two toothed wheels (55,56), which are provided with rotational drive means.
7. Device for loading and centring of spools (1) on support plates, according to claim 6, characterised in that the device (28) for fitting the spool comprises means for regulation of the path of the thruster (29), consisting of means for adjustment of the distance between the toothed wheels (55,56).
8. Method for loading and centring of spools (1) on support plates (15), which are provided with a rod (40) and centring and restraining springs (41), to be sent for winding in an automatic spooler, characterised in that it comprises in sequence the steps of presentation and centring of the spool (1) on the support (15), in order to fit the tube of the spool (1) onto the top of the rod (40) of the support plate (15), release of the said spool (1) presented, until it is supported on the springs (41) of the plate support (15), and finally fitting of the spool, with a useful path which extends until the spool is supported against a base stop (42) of the support plate (15).

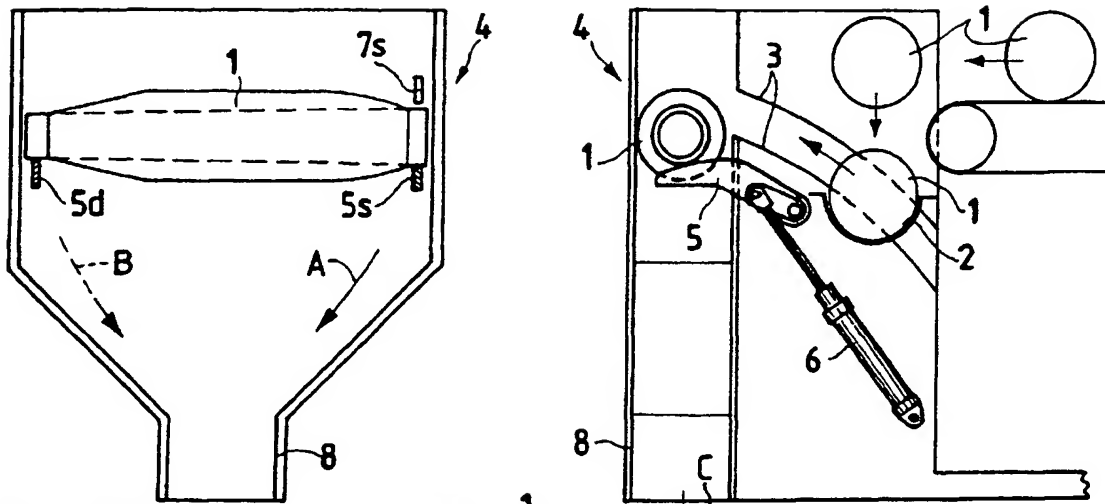


Fig.1C

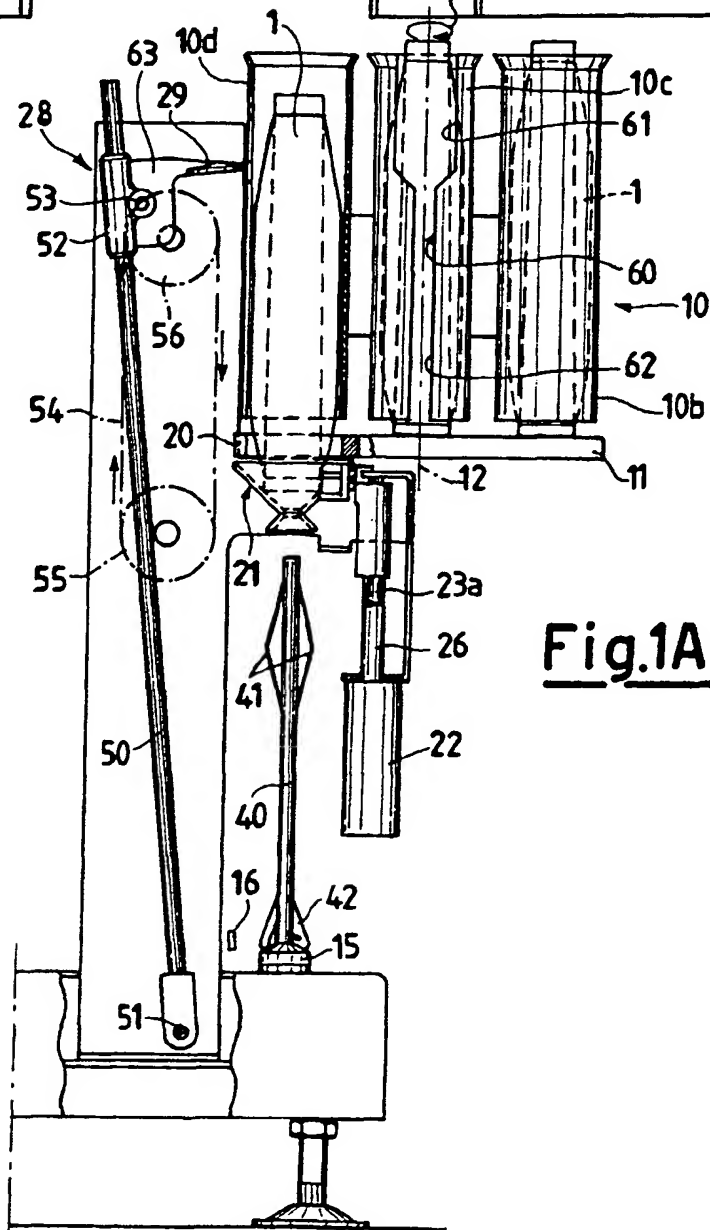
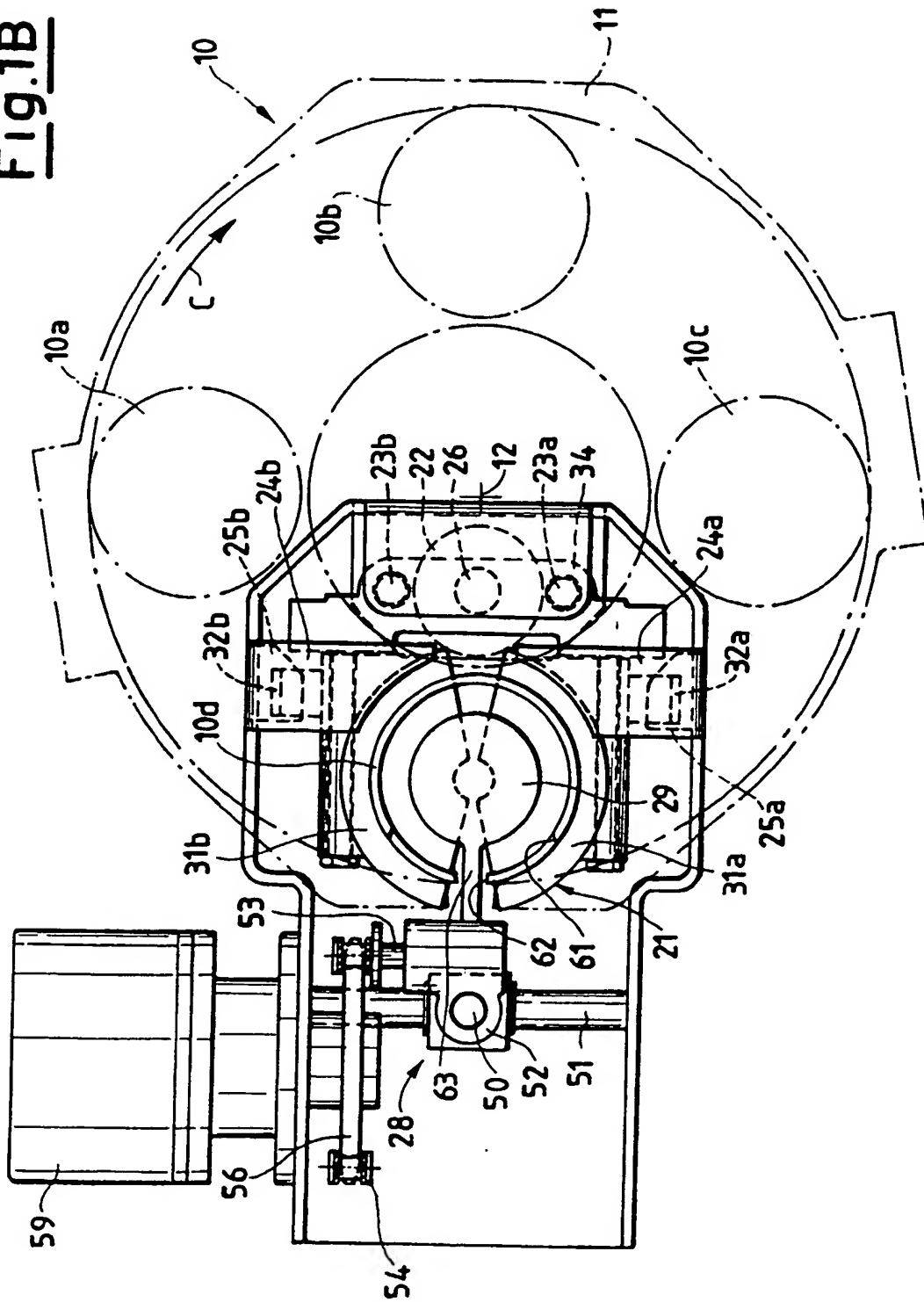


Fig.1A

Fig. 1B



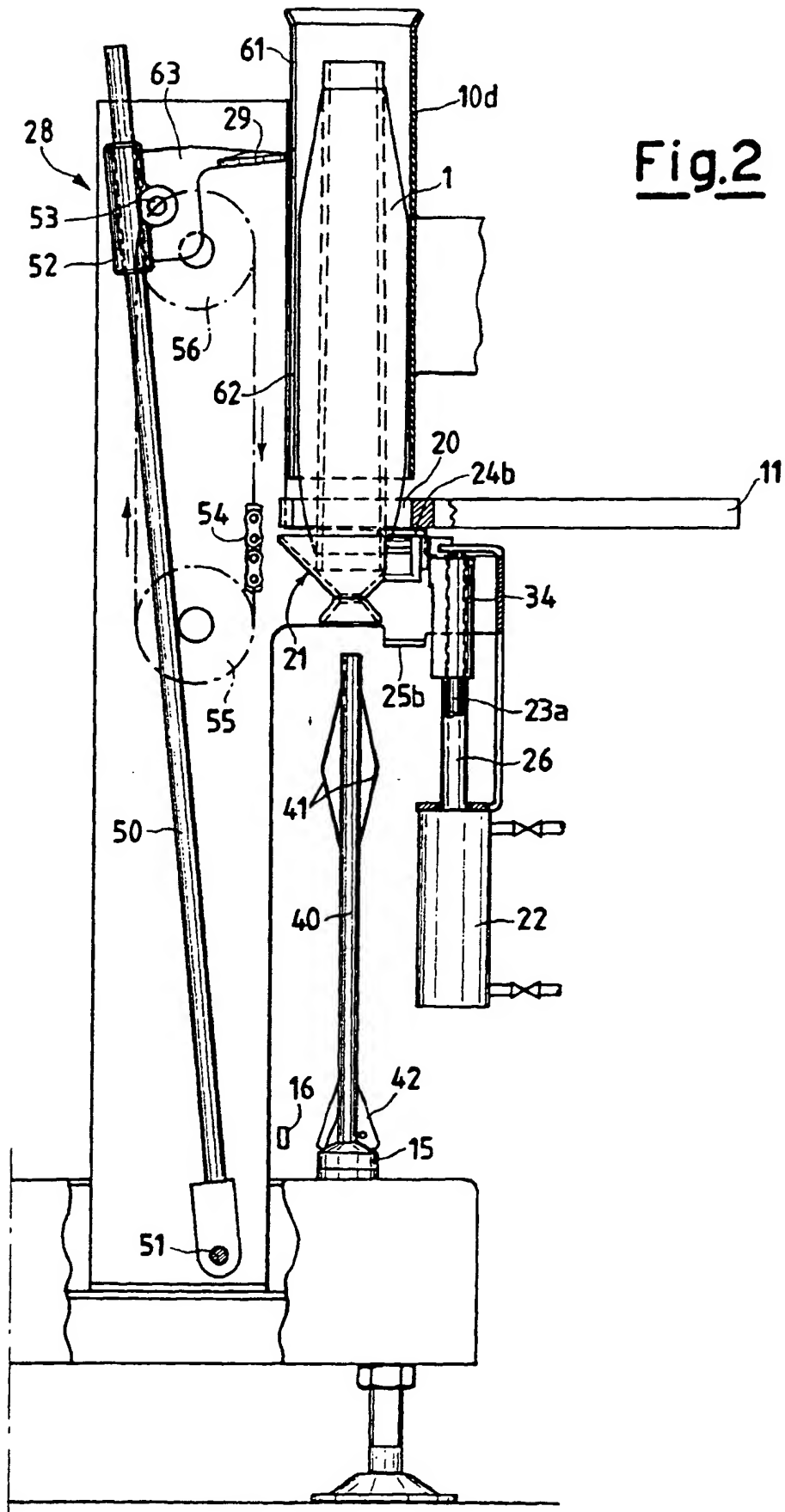


Fig.3

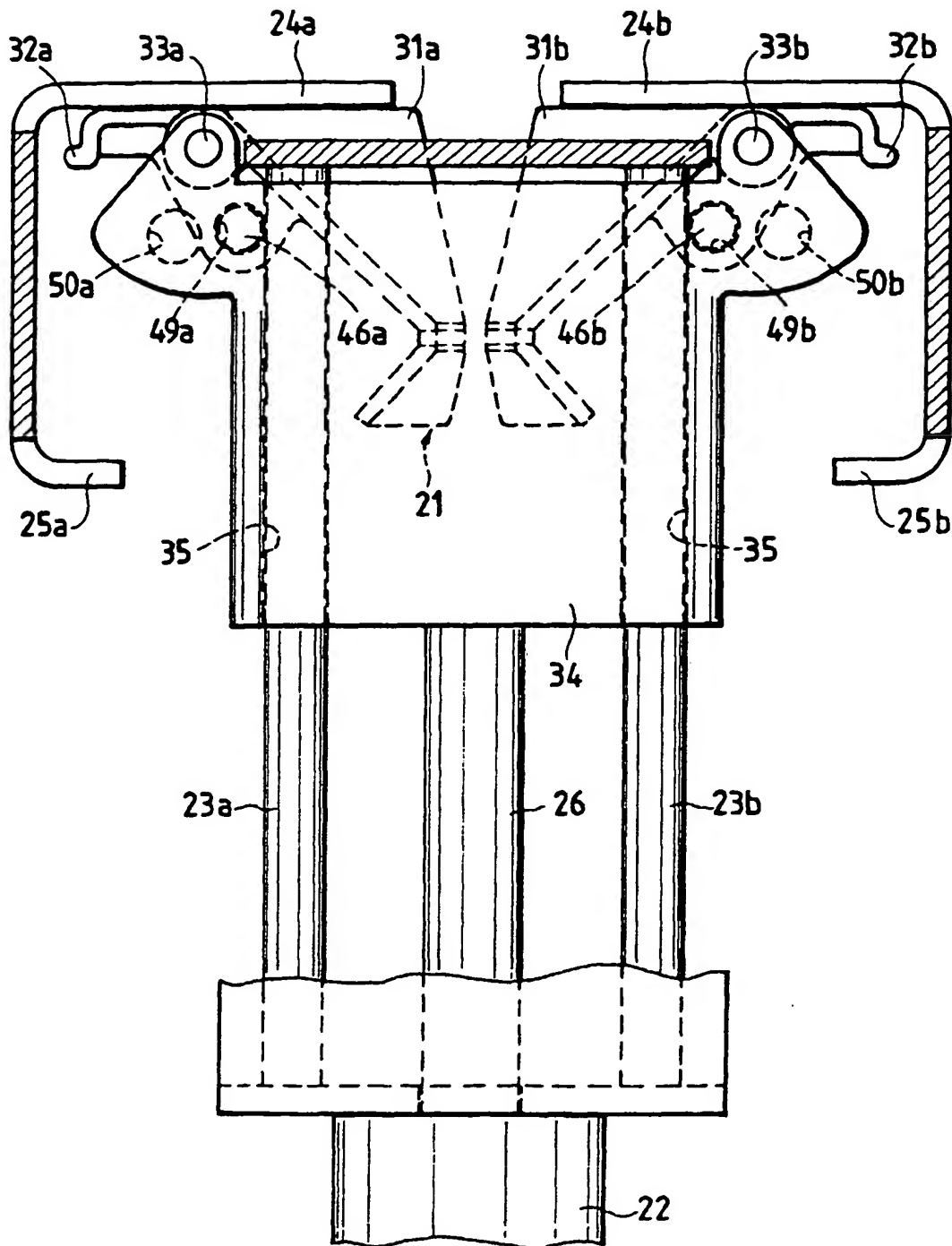


Fig.4

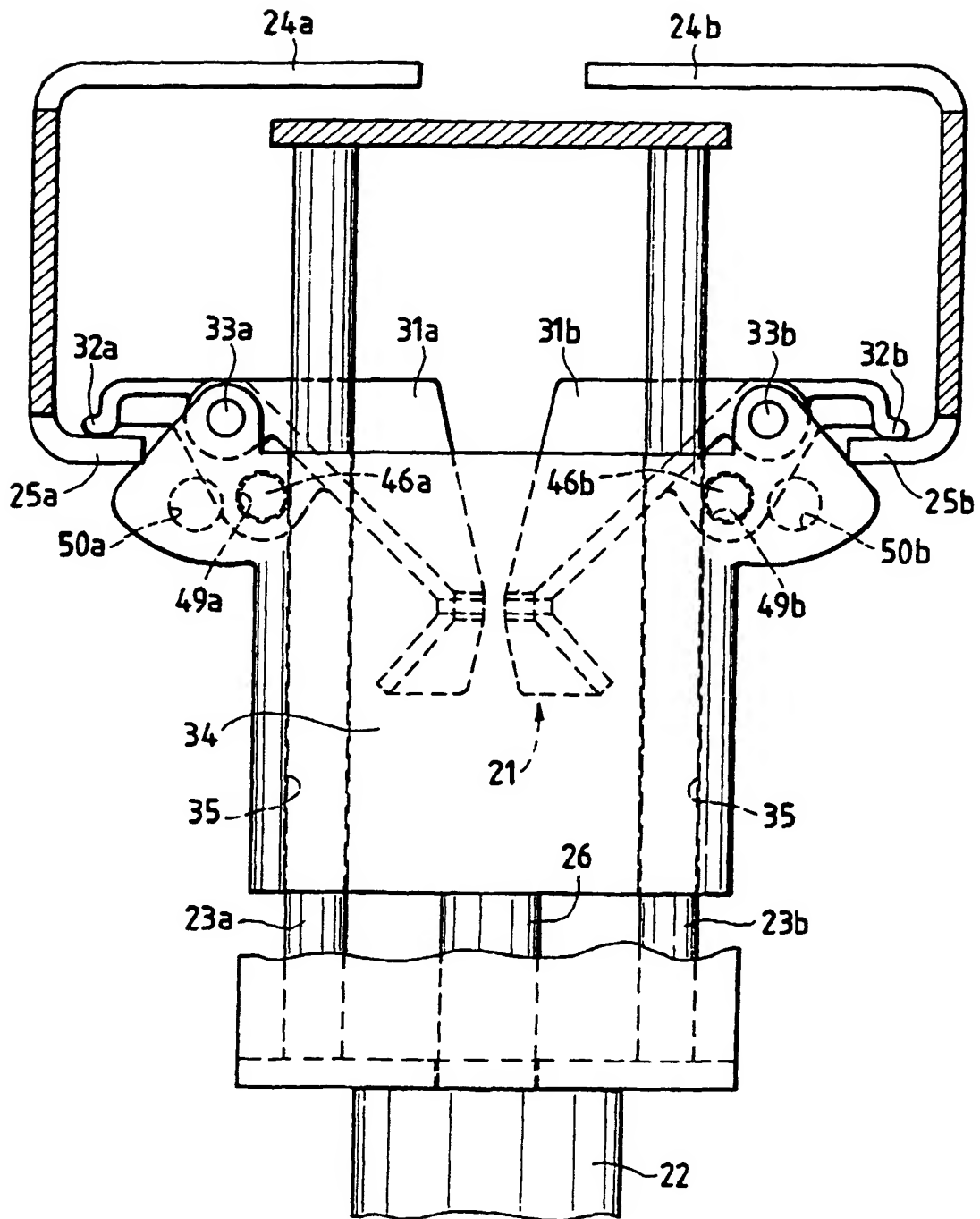
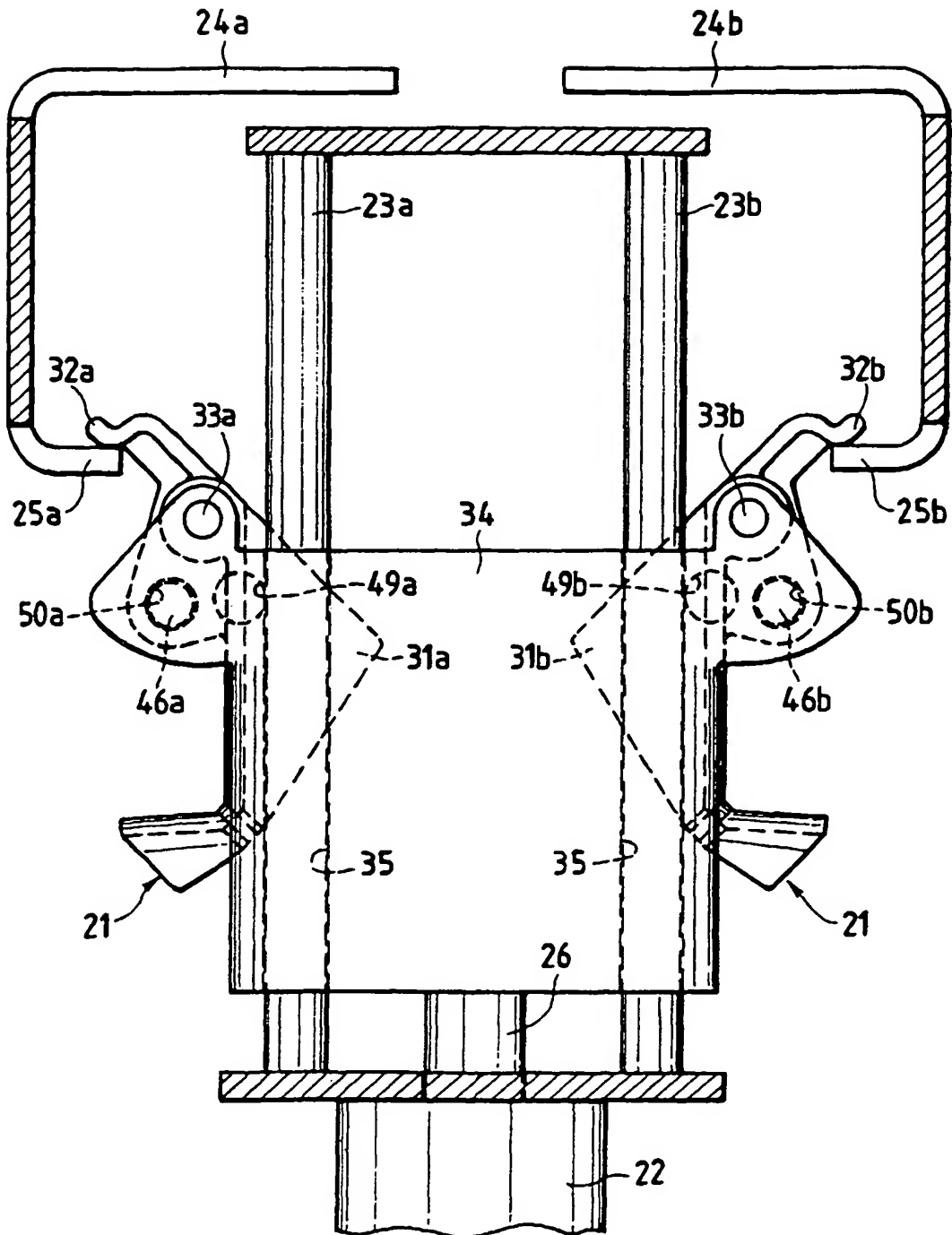
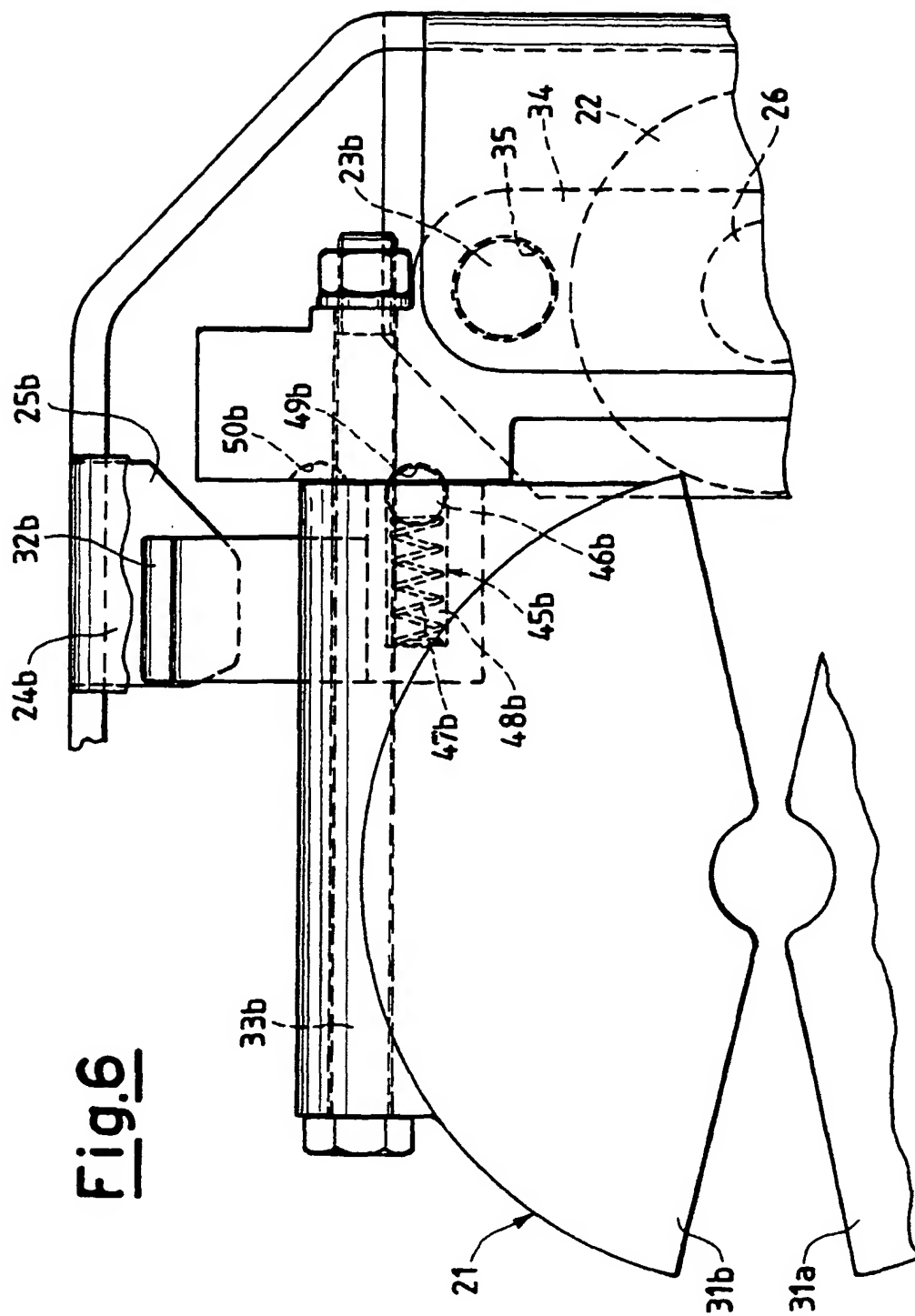
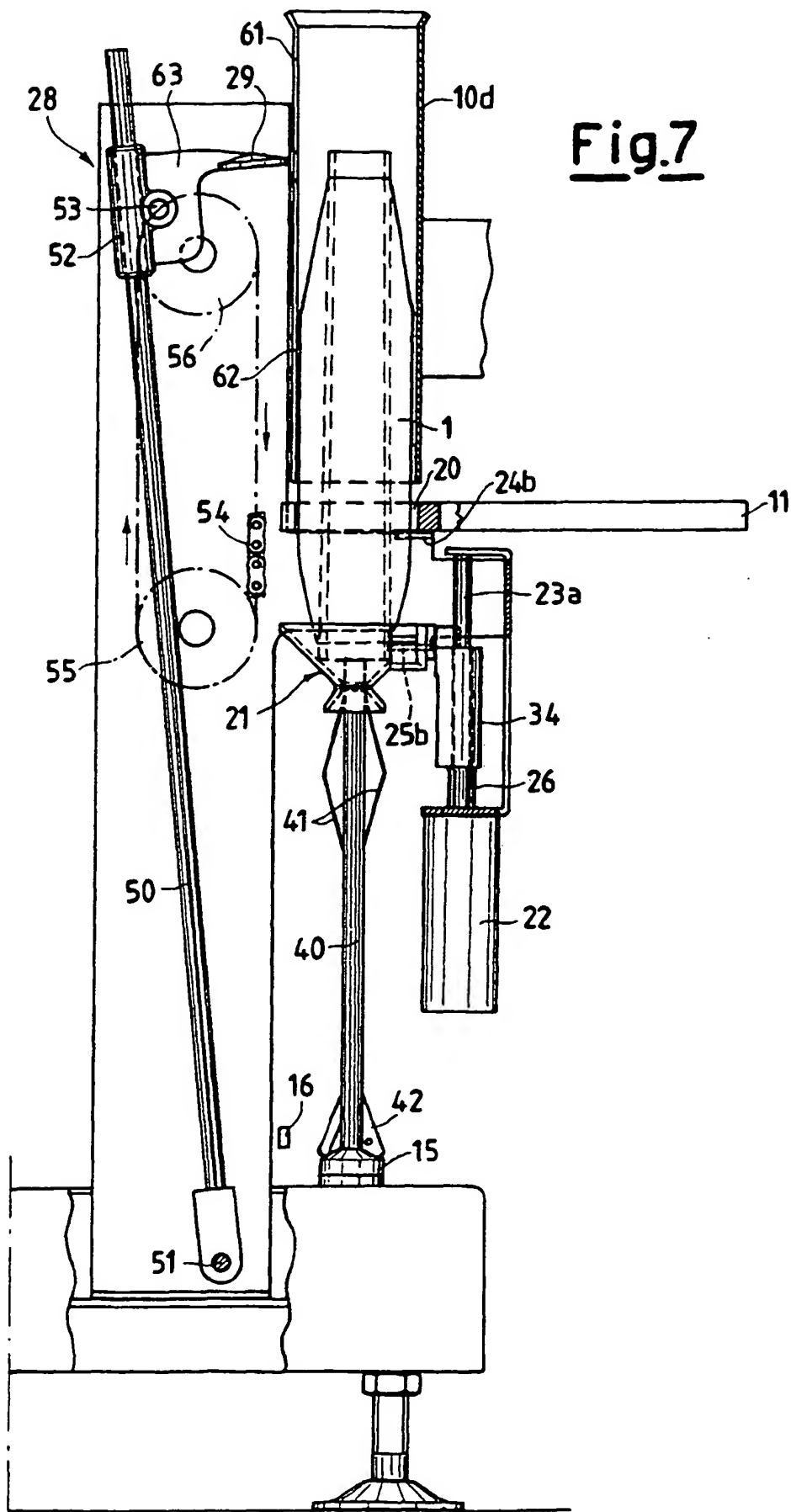
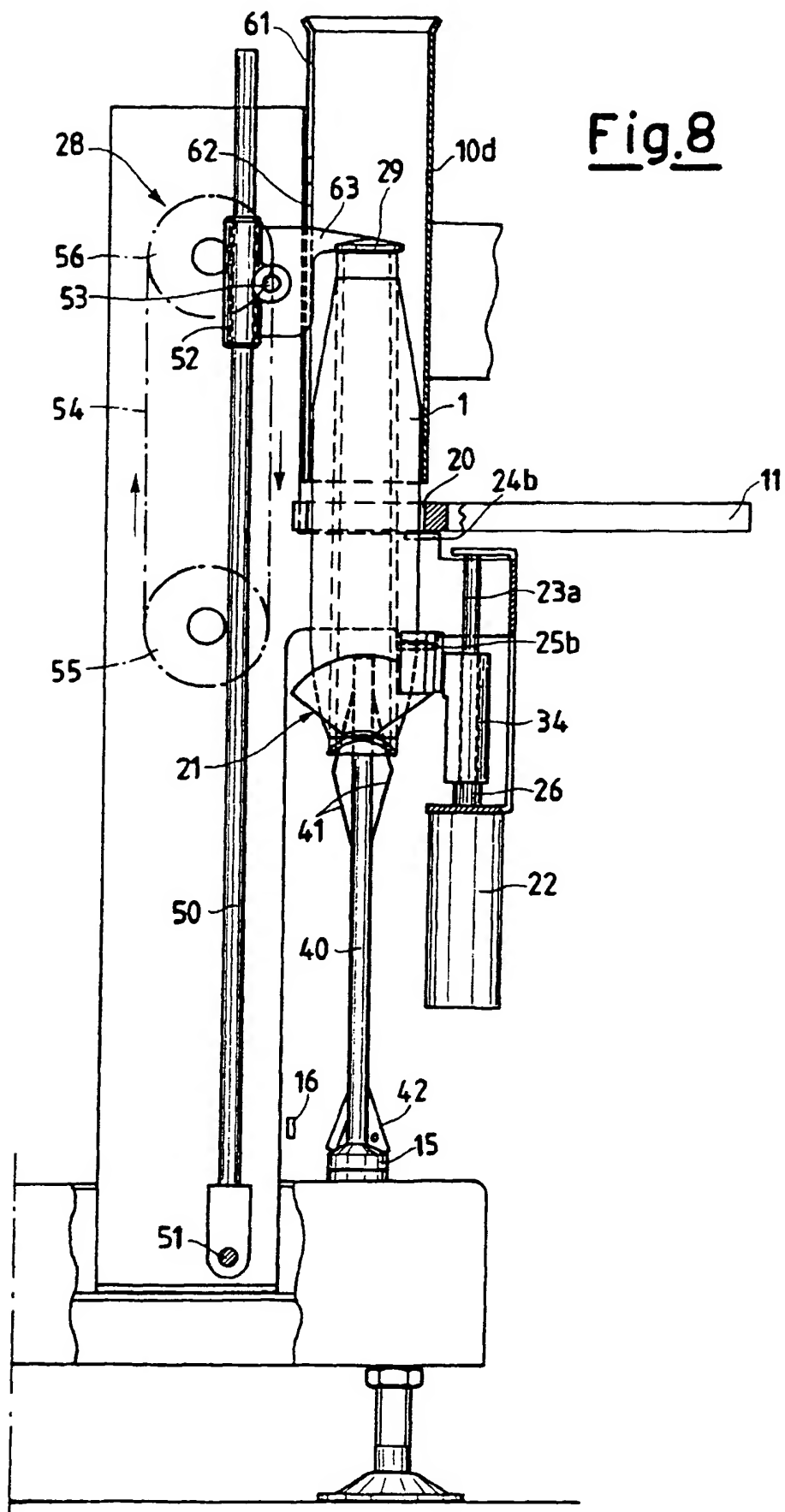


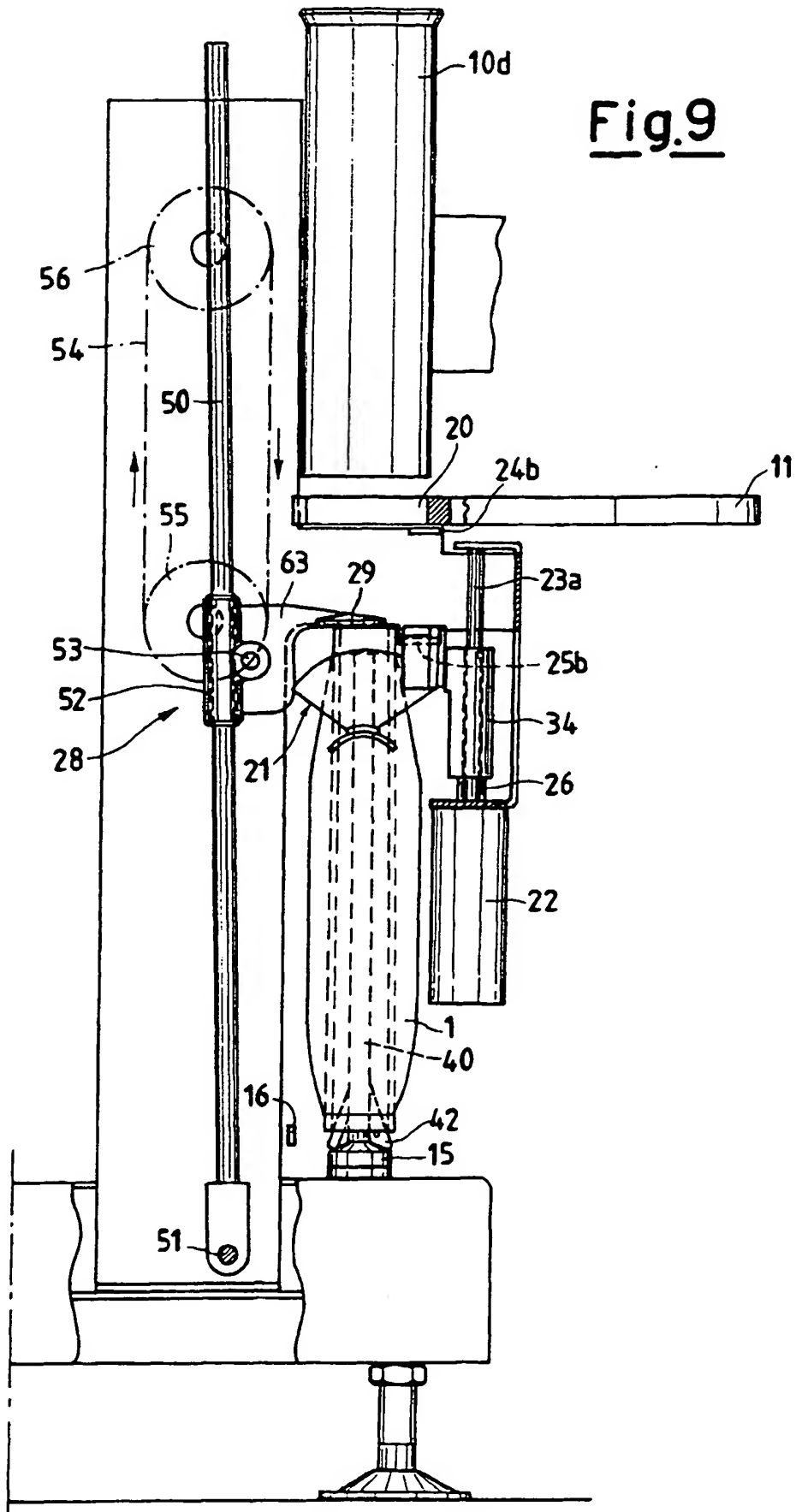
Fig.5

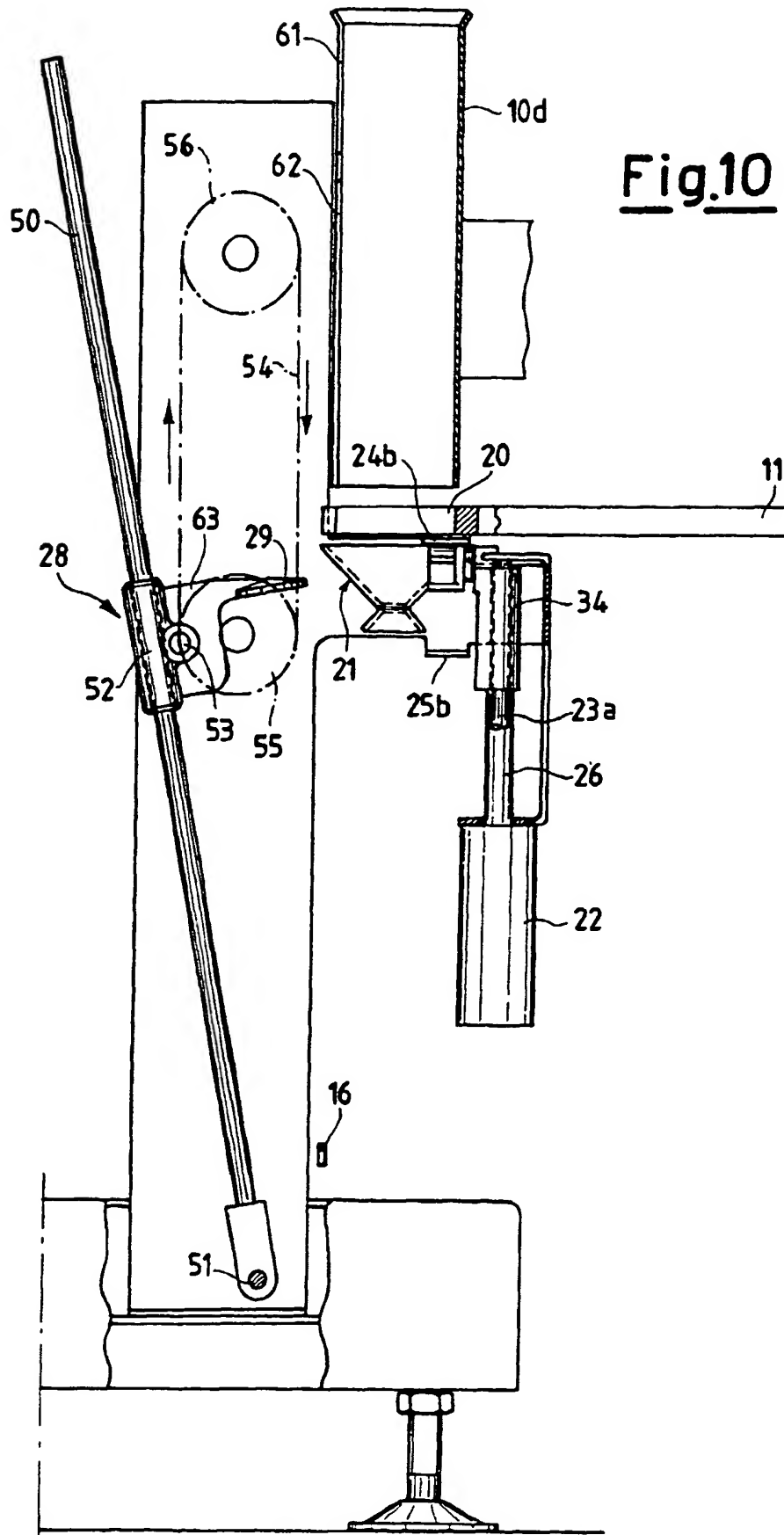












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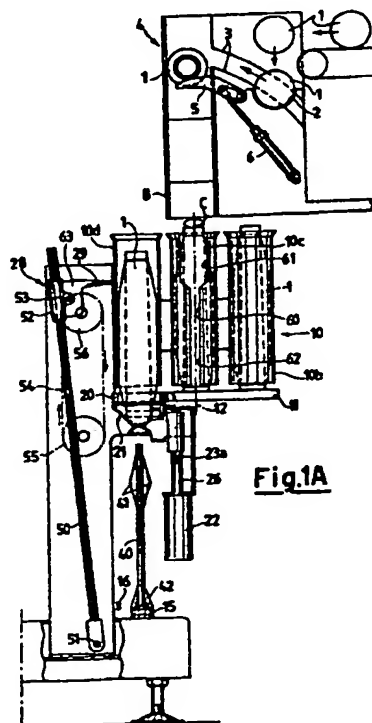
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(54) **Device for loading spools onto a plate support, for transport and positioning of the spools in textile machines**

(57) Device for loading spools (1) onto support plates (15), which are provided with a rod (40) and centring and restraining springs (41), in order to send the said spools for winding, comprising a device (21) for presentation and centring of the spool (1) on the support (15), in order to fit the tube of the spool (1) onto the top of the rod (40), and a spool-fitting device (28), which can travel a path which corresponds to fitting of the spool, as far as its base stop (42) on the support plate (15).



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EUROPEAN SEARCH REPORT

Application Number
EP 99 20 2408

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	FR 2 554 098 A (MURATA KIKAI K.K.) 3 May 1985 (1985-05-03) * page 8, line 30 - page 9, line 29 *	1,8	B65H67/06 D01H9/18
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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			B65H D01H
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 11 September 2000	Examiner Goodall, C
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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